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**Digital Enhanced Cordless Telecommunications (DECT);**
**New Generation DECT;**
**Part 1: Wideband speech**

Reference
RTS/DECT-NG269-1

Keywords
7 kHz, audio, codec, DECT, GAP, IMT-2000, interoperability, mobility, profile, radio, speech, TDD, TDMA

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# Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Digital Enhanced Cordless Telecommunications (DECT).

The present document is based on EN 300 175 parts 1 [1] to 8 [8] and EN 300 444 [12]. General attachment requirements and speech attachment requirements are based on EN 301 406 [11] (replacing TBR 006 [i.2]) and EN 300 176-2 [10] (previously covered by TBR 010 [i.3]). Further details of the DECT system may be found in TR 101 178 [i.1].

The present document has been developed in accordance to the rules of documenting a profile specification as described in ISO/IEC 9646-6 [i.13].

The information in the present document is believed to be correct at the time of publication. However, DECT standardization is a rapidly changing area, and it is possible that some of the information contained in the present document may become outdated or incomplete within relatively short time-scales.

The present document is part 1 of a multi-part deliverable covering the New Generation DECT as identified below:

**Part 1: "Wideband speech";**

Part 2: "Support of transparent IP packet data";

Part 3: "Extended wideband speech services";

Part 4: "Light Data Services; Software Update Over The Air (SUOTA), content downloading and HTTP based applications";

Part 5: "Additional feature set nr. 1 for extended wideband speech services".

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# 1 Scope

The present document specifies a set of functionalities of the New Generation DECT.

The New Generation DECT provides the following basic new functionalities:

- Wideband voice service (the present document).
- Packet-mode data service supporting Internet Protocol with efficient spectrum usage and high data rates (TS 102 527-2 [i.4]).
- Extended Wideband speech services (TS 102 527-3 [i.5]).
- Light Data Services: Software Update Over The Air (SUOTA), Content Downloading and HTTP based applications (TS 102 527-4 [i.11]).
- Additional feature set nr.1 for Extended wideband speech services (TS 102 527-5 [i.12]).

All New Generation DECT devices will offer at least one of these services. If the device offers the wideband voice service, it will support also the DECT standard 32 kbit/s voice service according to EN 300 444 [12] (GAP).

All DECT devices claiming to be compliant with this Application Profile will offer at least the basic services defined as mandatory. In addition to that, optional features can be implemented to offer additional DECT services.

The aim of the present document is to guarantee a sufficient level of interoperability and to provide an easy route for the development of DECT wideband speech applications, with the features of the present document being a common fall-back option available in all devices compliant to this profile.

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# 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

## 2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] ETSI EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".

[3] ETSI EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".

[4] ETSI EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[5] ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[6] ETSI EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[7] ETSI EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[8] ETSI EN 300 175-8: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech and audio coding and transmission".

[9] Void.

[10] ETSI EN 300 176-2: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 2: Audio and speech".

[11] ETSI EN 301 406: "Digital Enhanced Cordless Telecommunications (DECT); Harmonized EN for Digital Enhanced Cordless Telecommunications (DECT) covering the essential requirements under article 3.2 of the R&TTE Directive; Generic radio".

[12] ETSI EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".

[13] Void.

[14] Void.

[15] Recommendation ITU-T G.726 (12/1990): "40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)".

[16] Recommendation ITU-T G.711 (11/1988): "Pulse code modulation (PCM) of voice frequencies".

[17] Recommendation ITU-T G.722 (09/2012): "7 kHz audio-coding within 64 kbit/s".

[18] Recommendation ITU-T G.729.1 (05/2006): "G.729 based embedded variable bit-rate coder: An 8-32 kbit/s scalable wideband coder bitstream interoperable with G.729".

[19] ISO/IEC 14496-3:2009: "Information technology - Coding of audio-visual objects - Part 3: Audio".

## 2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A high Level Guide to the DECT Standardization".

[i.2] ETSI TBR 006: "Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements".

[i.3] ETSI TBR 010: "Digital Enhanced Cordless Telecommunications (DECT); General Terminal Attachment Requirements; Telephony Applications".

[i.4] ETSI TS 102 527-2: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 2: Support of transparent IP packet data".

[i.5] ETSI TS 102 527-3: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 3: Extended wideband speech services".

[i.6] Recommendation ITU-T P.311 (06/2005): "Transmission characteristics for wideband (150-7000 Hz) digital handset telephones".

[i.7] IETF RFC 3640: "RTP Payload Format for Transport of MPEG-4 Elementary Streams".

[i.8] IETF RFC 3016: "RTP Payload Format for MPEG-4 Audio/Visual Streams".

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[i.9] Recommendation ITU-T G.729: "Coding of speech at 8 kbit/s using conjugate structure algebraic-code-excited linear prediction (CS-ACELP)".

[i.10] IETF RFC 3261: "SIP: Session Initiation Protocol".

[i.11] ETSI TS 102 527-4: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 4: Light Data Services; Software Update Over The Air (SUOTA), content downloading and HTTP based applications".

[i.12] ETSI TS 102 527-5: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 5: Additional feature set nr. 1 for extended wideband speech services".

[i.13] ISO/IEC 9646-6: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".

[i.14] ISO/IEC 9646-7: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 444 [12] and the following apply:

**New Generation DECT (NG-DECT):** further development of the DECT standard introducing wideband speech, improved data services, new slot types and other technical enhancements

**super-wideband speech:** voice service with enhanced quality compared to ADPCM G.726 and allowing the transmission of a maximum vocal frequency of at least 14 kHz

**wideband speech:** voice service with enhanced quality compared to ADPCM G.726 and allowing the transmission of a vocal frequency range of at least 150 Hz to 7 kHz, and fulfilling the audio performance requirements described in the Recommendation ITU-T P.311 [i.6]

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## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

| | |
|---|---|
| C | Conditional to support (process mandatory) |
| I | out-of-scope (provision optional, process optional) not subject for testing |
| M | Mandatory to support (provision mandatory, process mandatory) |
| N/A | Not Applicable (in the given context the specification makes it impossible to use this capability) |
| O | Optional to support (provision optional, process mandatory) |
| ZAP | ability first to assign and then to re-program the account data held in the PP |

Provision mandatory, process mandatory means that the indicated feature service or procedure will be implemented as described in the present document, and may be subject to testing.

Provision optional, process mandatory means that the indicated feature, service or procedure may be implemented, and if implemented, the feature, service or procedure will be implemented as described in the present document, and may be subject to testing.

NOTE: The used notation is based on the notation proposed in ISO/IEC 9646-7 [i.14].

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| AAC | Advanced Audio Coding (MPEG) |
| AAC-LD | Advanced Audio Coding - Low Delay profile |
| AC | Authentication Code |
| ADPCM | Adaptive Differential Pulse Code Modulation |
| AES | Advanced Encryption Standard |
| AI | Air Interface |
| A-MAP | A-field mapping |
| ARI | Access Rights Identity |
| ARQ | Automatic Repear reQuest |
| ASC | AudioSpecificConfig |
| BFI | Bad Frame Indicator |
| B-MAP | B-field mapping |
| $B_S$ | Slow Broadcast channel |
| CC | Call Control |
| $C_F$ | higher layer signalling Channel (fast) |
| CI | Common Interface |
| CLIP | Calling Line Identification Presentation |
| CN | Carrier Number |
| CNIP | Calling Name Identification Presentation |
| CODEC | COder-DECoder |
| CRC | Cyclic Redundancy Check |
| $C_S$ | higher layer signalling Channel (slow) |
| DCK | Derived Cipher Key |
| DECT | Digital Enhanced Cordless Telecommunications |
| DLC | Data Link Control |
| DLEI | Data Link Endpoint Identifier |
| D-MAP | D-field mapping |
| DSAA | DECT Standard Authentication Algorithm |
| DSAA2 | DECT Standard Authentication Algorithm #2 |
| DSC | DECT Standard Cipher (algorithm) |
| DSC2 | DECT Standard Cipher (algorithm) #2 |
| DTMF | Dual Tone Multi-Frequency |
| ECN | Exchanged Connection Number |
| ER | Error Resilient (MPEG) |
| ESC | ESCape bit |
| EV-CELP | Embedded Variable Code Excited Linear Prediction |
| EV-CELP | Embedded Variable Code Excited Linear Prediction |
| FEC | Forward Error Correction |
| FMID | Fixed part MAC IDentity |
| FP | Fixed Part |
| FT | Fixed radio Termination |
| GAP | Generic Access Profile |
| GFSK | Gaussian Frequency Shift Key |
| HATS | Head And Torso Simulator |
| HTTP | HyperText Transfer Protocol |
| IA | Implementation Alternative |
| IE | Information Element |
| $I_N$ | higher layer Information channel (uNprotected) |
| IO | Input Output |
| IP | Internet Protocol |
| IPUI | International Portable User Identity |
| ISDN | Integrated Services Digital Network |
| ITU-T | International Telecommunication Union - Telecommunication standardization sector |
| IWU | InterWorking Unit |
| LA | Location Area |
| LAPC | DLC layer C-plane protocol entity |

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| | |
|---|---|
| LATM | Low overhead Audio Transport Multiplex |
| LBN | Logical Bearer Number |
| LCE | Link Control Entity |
| LD | Low Delay (MPEG) |
| LLME | Lower Layer Management Entity |
| LOAS | Low Overhead Audio Stream |
| LOG PCM | LOGarithmic Pulse Code Modulation |
| LU | LAP-U service |
| MAC | Medium Access Control |
| MAP | bit MAPpings |
| MDCT | Modified Discrete Cosine Transform |
| ME | Management Entity |
| MIPS | Million Instructions Per Seconds |
| MM | Mobility Management |
| MOS | Mean Opinion Score |
| MPEG | Motion Picture Experts Group |
| $M_T$ | Mac control channel on A-tail field, or one message on such channel |
| MUX | time MUltipleXer |
| N | identities channel |
| NB | Narrow Band |
| NG | New Generation |
| NG-DECT | New Generation DECT |
| NR | Normal-Reverse |
| $N_T$ | Identities information, one N channel message |
| NWK | NetWorK |
| P | Public (environment) |
| PA | Portable Application |
| PABX | Private Automatic Branch eXchange |
| PAP | Publilc Access Profile |
| PARI | Primary Access Rights Identity |
| PARK | Portable Access Rights Key |
| PCM | Pulse Code Modulation |
| PHL | PHysical Layer |
| PLC | Packet Loss Concealment |
| PLI | Park Length Indicator |
| PMID | Portable part MAC IDentity |
| PP | Portable Part |
| PRA | Primary Rate Access (ISDN) |
| PSCN | Primary receiver Scan Carrier Number |
| PSTN | Public Switched Telephone Network |
| PT | Portable radio Termination |
| PUN | Portable User Number |
| PUT | Portable User Type |
| Q | system information channel |
| $Q_T$ | system information and multiframe marker (MAC logical channel) |
| R/B | Residential/Business (environment) |
| RAM | Random Access Memory |
| RFC | Request For Comments |
| RFP | Radio Fixed Part |
| RFPI | Radio Fixed Part Identity |
| ROM | Read Only Memory |
| RPN | Radio Fixed Part Number |
| RTP | Real-Time Transport Protocol |
| S/T | ISDN S/T Interface |
| SAP | Service Access Point |
| SAPI | Service Access Point Identifier |
| SARI | Secondary Access Rights Identity |
| SC | Speech Coding |
| SDP | Session Description Protocol |
| SDU | Service Data Unit |
| SN | Slot Number |

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| | |
|---|---|
| SP | Start Position |
| SPR | Spare Bits |
| TARI | Tertiary Access Rights Identity |
| TCL | Telephone Coupling Loss |
| TCLw | weightedTelephone Coupling Loss |
| TDBWE | Time Domain Bandwidth Extension |
| TDMA | Time Division Multiple Access |
| TPUI | Temporary Portable User Identity |
| TRUP | TRansparent UnProtected service |
| U | ISDN U-Interface |
| UAK | User Authentication Key |
| UNF | UNprotected Framed service |
| UPI | User Personal Identification |
| WB | Wideband |
| WMOPS | Weighted Millions of Operations Per Second |

# 4 Description of services

## 4.1 Enhanced wideband speech

In traditional telephony applications the supported bandwidth is 3,1 kHz (300 Hz to 3,4 kHz). For a better speech quality and a more natural sound, a bandwidth of at least 150 Hz to 7 kHz should be supported and may be extended even further.

New Generation DECT improves audio quality by implementing wideband enhanced quality audio codecs. All New Generation DECT wideband speech devices shall implement wideband (150 Hz to 7 kHz) audio (16 kHz frequency sampling). DECT devices supporting wideband audio shall support the speech coding format according to Recommendation ITU-T G.722 [17]. In addition to that, other wideband and super-wideband audio codecs, providing even better audio quality, may be implemented.

In order to transport the higher bitrate of the new enhanced codecs, the bitrate per channel at the air interface is doubled from 32 kbit/s in traditional DECT to 64 kbit/s.

All New Generation DECT wideband speech devices shall be backward compatible with traditional DECT 32 kbit/s voice (GAP) devices. New PPs shall operate with legacy base stations (FPs), and new FPs shall support existing PPs. In such cases, the voice quality is the traditional DECT quality (32 kbit/s ADPCM).

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### 4.1.1 Audio performance requirements

New Generation DECT handsets shall fulfil the audio performance requirements described in EN 300 175-8 [8]. Different audio specifications are available for different applications, services and performance levels. The basic audio specification for Wideband speech handsets (known as PP type 2a, see EN 300 175-8 [8]) fulfils the requirements of Recommendation ITU-T P.311 [i.6]. There is the option of implementing more demanding specifications (PP types 2b and 2c of EN 300 175-8 [8]) providing superior performance.

## 4.2 Wideband speech scenarios

The following scenarios are envisaged.

### 4.2.1 Internal calls inside a New Generation DECT system

Figure 1 shows an internal call within a New Generation DECT system. In this scenario a wideband (150 Hz to 7 kHz) communication is possible between both terminals without any special issue.